

WHAT IS CLAIMED IS:

1. An apparatus, comprising:
a voltage regulator operable to:
regulate a supply voltage to an on-chip module
5 having an operational current;
draw a supply current; and
supply the operation current to the on-chip
module;

wherein the supply current drawn by the voltage
10 regulator is proportional to the operating current of the
on-chip module.

2. The apparatus of Claim 1, wherein the voltage
regulator includes:
15 a source follower portion generally operable to
regulate the supply voltage to the on-chip module; and
a drive extender portion generally operable to draw
a supply current proportional to the operating current of
the on-chip module in order to supply the operating
20 current to the on-chip module.

3. The apparatus of Claim 1, wherein the supply
current drawn by the voltage regulator includes:
a fixed current component; and
25 a variable current component that varies in
proportion to the operating current of the on-chip
module.

4. The apparatus of Claim 3, wherein the variable
30 current component of the source current supplies most of
the operating current of the on-chip module during the
operation of the on-chip module.

5. The apparatus of Claim 3, wherein:

the fixed current component of the source current is generally used to regulate the supply voltage to the on-chip module; and

the variable current component of the source current is generally used to supply the operational current of the on-chip module.

6. The apparatus of Claim 1, further comprising a current source that supplies the voltage regulator with a variable source current; and

wherein the voltage regulator supplies the operating current of the on-chip module based at least on the variable source current.

7. The apparatus of Claim 6, wherein the maximum current that can be supplied to the on-chip module by the voltage generator varies based on the variable source current received from the current source.

8. The apparatus of Claim 6, wherein the current source is a replica of a component of the on-chip module and is biased such that the variable source current supplied by the current source to the voltage regulator is equal to the maximum anticipated operational current required by the on-chip module, the maximum anticipated operational current required by the on-chip module being defined as the operational current of the on-chip module when the on-chip module operates at its maximum anticipated frequency.

9. The apparatus of Claim 8, wherein:

the current source is fabricated along with the on-chip module such that that the silicon processing characteristics of the current source are similar to those of the replicated component of the on-chip module; and

the current source is located proximate the on-chip module such that the operating temperature of the current source is similar to that of the replicated component of the on-chip module.

10. The apparatus of Claim 6, wherein:

the on-chip module is a phase-locked loop device including a plurality of half-buffers; and

the current source is a replica of one of the plurality of half-buffers.

11. The apparatus of Claim 6, wherein the on-chip module is a delay-locked loop device.

12. A method, comprising:
regulating a supply voltage to an on-chip module
having an operational current;
drawing a supply current; and
5 supplying the operation current to the on-chip
module;

wherein the supply current drawn by the voltage
regulator is proportional to the operating current of the
on-chip module.

10 13. The method of Claim 12, wherein drawing the
supply current includes:

drawing a fixed current component of the supply
current; and

15 drawing a variable current component of the supply
current, wherein the variable current component varies in
proportion to the operating current of the on-chip
module.

20 14. The method of Claim 13, further comprising:
using the fixed current component of the source to
regulate the supply voltage to the on-chip module; and

using the variable current component of the source
current to supply the operational current of the on-chip
25 module.

15. The method of Claim 12, further comprising
receiving a variable source current from a current
source; and

30 supplying the operating current of the on-chip
module based at least on the received variable source
current.

16. The method of Claim 15, wherein the maximum
current that can be supplied to the on-chip module by the
voltage generator varies based on the variable source
5 current received from the current source.

17. The method of Claim 15, wherein:

the current source is a replica of a component of
the on-chip module; and

10 the method further comprises biasing the current
source such that the variable source current supplied by
the current source to the voltage regulator is equal to
the maximum anticipated operational current required by
the on-chip module, the maximum anticipated operational
15 current required by the on-chip module being defined as
the operational current of the on-chip module when the
on-chip module operates at its maximum anticipated
frequency.

20 18. The method of Claim 8, further comprising:

fabricated the current source along with the on-chip
module such that that the silicon processing
characteristics of the current source are similar to
those of the replicated component of the on-chip module;
25 and

locating the current source proximate the on-chip
module such that the operating temperature of the current
source is similar to that of the replicated component of
the on-chip module.

19. The method of Claim 15, wherein:

the on-chip module is a phase-locked loop device including a plurality of half-buffers; and

5 the current source is a replica of one of the plurality of half-buffers.

20. The method of Claim 15, wherein the on-chip module is a delay-locked loop device.

21. An apparatus, comprising:

a voltage regulator operable to:

regulate a supply voltage to an on-chip module
having an operational current;

5 draw a supply current; and

supply the operation current to the on-chip
module;

wherein the supply current drawn by the voltage
regulator is proportional to the operating current of the
10 on-chip module; and

a current source that supplies the voltage regulator
with a variable source current, the current source
comprising a replica of a component of the on-chip module
that is biased such that the variable source current
15 supplied by the current source is equal to the maximum
anticipated operational current required by the on-chip
module, the maximum anticipated operational current
required by the on-chip module being defined as the
operational current of the on-chip module when the on-
20 chip module operates at its maximum anticipated
frequency;

wherein the voltage regulator supplies the operating
current of the on-chip module based at least on the
variable source current.

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22. The apparatus of Claim 21, wherein:

the on-chip module is a phase-locked loop device
including a plurality of half-buffers; and

the current source is a replica of one of the
30 plurality of half-buffers.